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# MYCOTAXON

ISSN (print) 0093-4666 (online) 2154-8889 Mycotaxon, Ltd. ©2021

April–June 2021—Volume 136, pp. 387–400

<https://doi.org/10.5248/136.387>

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## ***Calogaya miniata* comb. nov., *Huneckia crocina* comb. nov., and new neotropical records of *Wetmoreana brouardii***

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**ABSTRACT**—New combinations *Calogaya miniata* and *Huneckia crocina* are proposed for species previously placed in *Caloplaca* s.lat., following the revised classification of *Teloschistaceae*. The taxonomy of *Wetmoreana brouardii* is discussed in relation to *Caloplaca ochraceofulva*, and its current world distribution is presented, including new records from Chile, Colombia, Peru, and Uruguay.

**KEY WORDS**—lichenized *Ascomycota*, nomenclature, South America, *Teloschistaceae*

### **Introduction**

Since the publication of the new systematic arrangement of *Teloschistaceae* (Arup & al. 2013), many new genera have been proposed (e.g., Kondratyuk & al. 2014a, 2017; Söchting & al. 2014a, b; Wilk & al. 2021), with the family now comprising more than 100 genera (Kondratyuk & al. 2018). The genera are distributed among the subfamilies *Caloplacoideae*, *Teloschistoideae*, and *Xanthorioideae* (Gaya & al. 2012; Arup & al. 2013).

During an ongoing taxonomic and molecular survey on *Teloschistaceae* in Bolivia and Peru, many new discoveries were made, some already published in Wilk & Flakus (2017), Wilk (2020), and Wilk & al. (2021). In this work, two new nomenclatural combinations for species previously placed in *Caloplaca* s.lat. are proposed in *Calogaya* Arup & al., and *Huneckia* S.Y. Kondr. & al. *Calogaya* is well-delimited molecularly (Gaya & al. 2011 as “*Caloplaca saxicola* group”; Arup & al. 2013; Vondrák & al. 2016, 2018).

*Huneckia* is a genus recently proposed to accommodate two species, *H. pollinii* (A. Massal.) S.Y. Kondr. & al. and *H. rheinigera* (Elix & S.Y. Kondr.) S.Y. Kondr. & al., both characterized by production of an unusual, thick-walled type of ascospore (Kondratyuk & al. 2014a). *Huneckia* seems to be well-defined molecularly, morphologically, and chemically (see below for further discussion).

Current phylogenetic analyses based on three rDNA loci (ITS, nucLSU, and mtSSU) place *Caloplaca crocina*, a species producing hourglass-shaped ascospores, in *Huneckia* (*Caloplacoideae*) and *Caloplaca rouxii* in *Calogaya* (*Xanthorioideae*).

*Wetmoreana brouardii* is morphologically similar and often misidentified as *Caloplaca ochraceofulva* (Müll. Arg.) Jatta, for which molecular data are not yet available. Both taxa are discussed below, and the current world distribution of *W. brouardii* is presented.

## Materials & methods

This study is based on the collections from the following herbaria: B, BM, E, G, KRAM, LD, M, MEL, MIN, S, and UPS. For species identification morphological characters were measured from dry material using a Nikon SMZ 1270 dissecting microscope. Anatomical characters were measured from hand-cut sections mounted in water using a Nikon Eclipse 50i light microscope. The conidia were measured based on photographs. To study the thallus anatomy of *W. brouardii* and *C. ochraceofulva* high-quality cross sections of lobes were prepared by selecting lobes which overlap other lichen thalli if possible. The granulation of anatomical structures was observed in polarized light, and solubility of granules/crystals and colour reactions were determined using 25% KOH (K) and 65% nitric acid (N). Hydrochloric acid (HCl) was used to test for the presence of calcium carbonate ( $\text{CaCO}_3$ ) in the rocky substrate. Thallic and apothecial terminology follows Bungartz (2002) and Ryan & al. (2002, 2012). Photographic documentation was made with a Nikon DS-Fi2 digital camera combined with the imaging software NIS-Elements D v. 4.30.

The sequences used in the study were sourced from Wilk & al. (2021) and references therein (see Table 1 for voucher information and GenBank accession numbers). The datasets were subjected to maximum likelihood (ML) analysis in RAxML v. 8.2.0 (Stamatakis 2014) under the GTR-Gamma model. Branch support was assessed by bootstrapping (100 replicates). Phylogenetic trees were visualized and edited in FigTree v. 1.4.4 (Rambaut 2018) and Inkscape v. 0.92 graphic software (<http://inkscape.org>).

The current phylogenetic analyses are a continuation of the study started by Wilk & al. (2021), and the phylogenetic *Teloschistaceae* tree therein was used as reference tree for this survey.

TABLE 1. Sequences downloaded from GenBank and used in the phylogenetic analyses.

| SPECIES                                           | REFERENCE              | VOUCHER                                                                                               | ITS      | nucLSU    | mtSSU     |
|---------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------------------|----------|-----------|-----------|
| <i>Blastenia ammiospila</i>                       | Arup & al. 2013        | Austria, Söchting 9345, C (ITS, mtSSU); Norway, Söchting 10092, C (nucLSU)                            | KC179413 | KC179161  | KC179491  |
| <i>Blastenia crenularia</i>                       | Arup & al. 2013        | Iceland, Söchting 7523, C                                                                             | KC179415 | KC179162  | KC179492  |
| <i>Bryoplaca sinapisperma</i>                     | Arup & al. 2013        | Norway, Arup L08184, LD                                                                               | KC179421 | -         | KC179495  |
| <i>Bryoplaca tetraspora</i>                       | Arup & al. 2013        | Antarctica, South Shetland Isl. Söchting 7979, C (ITS); Denmark, Greenland, Söchting 10480, C (mtSSU) | KC179422 | -         | KC179496  |
| <i>Calogaya alaskensis</i>                        | Arup & al. 2013        | Sweden, Arup L04335, LD                                                                               | KC179341 | -         | -         |
| <i>Calogaya arnoldii</i> 1                        | Arup & al. 2013        | Sweden, Arup L06205, LD (ITS); Sweden, Söchting 10610, C (nucLSU)                                     | KC179342 | KC179165* | -         |
| <i>Calogaya arnoldii</i> 2                        | Gaya & al. 2008        | France, Clauzade s.n., MARSSJ holotype                                                                | EU639633 | -         | -         |
| <i>Calogaya arnoldii</i> s.l.                     | Arup & al. 2013        | Denmark, Söchting 7472, C                                                                             | KC179343 | KC179166* | KC179497* |
| <i>Calogaya arnoldii</i> subsp. <i>obliterata</i> | Gaya & al. 2012        | Sweden, Gaya & al. s.n., BCN                                                                          | JQ301657 | JQ301547* | JQ301481* |
| <i>Calogaya arnoldiiconfusa</i>                   | Arup & al. 2013        | Austria, Hafellner s.n., GZU                                                                          | HM800875 | -         | -         |
| <i>Calogaya biatorina</i> 1                       | Arup & al. 2013        | Austria, Arup L97807, LD                                                                              | AF353953 | -         | -         |
| <i>Calogaya biatorina</i> 2                       | Gaya & al. 2011        | Spain, Söchting 9608, BCN                                                                             | HM800895 | -         | -         |
| <i>Calogaya biatorina</i> 3                       | Gaya & al. 2011        | Spain, Gaya 267 & al., BCN                                                                            | HM800897 | -         | -         |
| <i>Calogaya biatorina</i> 4                       | Gaya & al. 2011        | USA, Montana, Wetmore 81529, MIN                                                                      | HM800898 | -         | -         |
| <i>Calogaya decipiens</i>                         | Arup & al. 2013        | Denmark, Söchting s.n., C                                                                             | KC179344 | KC179167* | KC179498* |
| <i>Calogaya lobulata</i> 1                        | Arup & al. 2013        | Poland, Cieśliński s.n., GZU                                                                          | KC179345 | -         | -         |
| <i>Calogaya lobulata</i> 2                        | Kondratyuk & al. 2014b | Australia, Tasmania, Kärnefelt 9977001, KW-L                                                          | KJ133449 | KJ133488* | KJ133507* |
| <i>Calogaya miniata</i> 1                         | Gaya & al. 2011        | Spain, Gaya 273 & al., BCN                                                                            | HM800883 | -         | -         |
| <i>Calogaya miniata</i> 2                         | Gaya & al. 2011        | Spain, Navarro-Rosinés 390, BCN                                                                       | HM800884 | -         | -         |
| <i>Calogaya miniata</i> 3                         | Gaya & al. 2011        | Austria, Poelt & al. s.n., GZU                                                                        | HM800885 | -         | -         |
| <i>Calogaya polycarpoides</i>                     | Arup & al. 2013        | Kazakhstan, Seaward s.n., Seaward priv. herb.                                                         | KC179346 | -         | -         |
| <i>Calogaya pusilla</i> 1                         | Arup & al. 2013        | Sweden, Arup L07089, LD                                                                               | KC179347 | -         | -         |
| <i>Calogaya pusilla</i> 2                         | Gaya & al. 2011        | Slovakia, Pisút & Poelt s.n., GZU                                                                     | HM800890 | -         | -         |
| <i>Calogaya saxicola</i> 1                        | Gaya & al. 2011        | Canada, Northwest Territories, Gould 945, MIN                                                         | HM800882 | -         | -         |
| <i>Calogaya saxicola</i> 2                        | Gaya & al. 2011        | USA, Wyoming, Wetmore 80927, MIN                                                                      | HM800887 | -         | -         |
| <i>Calogaya saxicola</i> 3                        | Gaya & al. 2011        | USA, Nebraska, Wetmore 77946, MIN                                                                     | HM800870 | -         | -         |
| <i>Calogaya schistidii</i>                        | Arup & al. 2013        | Austria, Arup L97464, LD                                                                              | KC179348 | -         | -         |

| SPECIES                                                                             | REFERENCE                                                | VOUCHER                                                                          | ITS      | nucLSU   | mtSSU    |
|-------------------------------------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------|----------|----------|----------|
| <i>Calogaya</i> sp.                                                                 | Arup & al. 2013                                          | Argentina, Frödén 1728, LD                                                       | KC179349 | –        | –        |
| <i>Caloplaca cerina</i>                                                             | Arup & al. 2013                                          | Norway, Svalbard, Elvebakk 03:084, TROM                                          | KC179425 | KC179168 | KC179499 |
| <i>Caloplaca chlorina</i>                                                           | Arup & al. 2013                                          | Sweden, Frödén 1876, LD (ITS); Denmark, Søchting 7321, C (nucLSU, mtSSU)         | KC179426 | KC179169 | KC179500 |
| <i>Caloplaca turkuensis</i>                                                         | Arup & al. 2013                                          | Sweden, Frödén 1909, LD                                                          | KC179432 | –        | KC179501 |
| <i>'Caloplaca' aggregata</i>                                                        | Kondratyuk & al. 2017                                    | Australia, Kantvilas 476/12, HO holotype                                         | KY614390 | KY614448 | KY614479 |
| <i>'Caloplaca' albolutescens</i>                                                    | Arup & al. 2013                                          | Sweden, Arup L09030, LD                                                          | KC179423 | –        | KC179502 |
| <i>'Caloplaca' atrolava</i>                                                         | Arup & al. 2013                                          | Sweden, Arup L06010, LD                                                          | KC179424 | KC179171 | KC179504 |
| <i>'Caloplaca' demissa</i>                                                          | Arup & al. 2013                                          | Italy, Arup L97911, LD                                                           | AF353960 | KC179172 | KC179505 |
| <i>'Caloplaca' fernandeziana</i>                                                    | Vargas Castillo & Beck 2012                              | Chile, Vargas 2415 & Stanton, M                                                  | JQ993841 | –        | –        |
| <i>'Caloplaca' furax</i>                                                            | Gaya & al. 2012                                          | Spain, Gaya, Fernández-Brime 557 & Llimona, BCN                                  | JQ301662 | JQ301554 | JQ301490 |
| <i>'Caloplaca' lecanorocarpa</i>                                                    | Aptroot & Cáceres 2016                                   | Brazil, Aptroot & Cáceres 21364, ISE holotype                                    | KU257734 | –        | –        |
| <i>'Caloplaca' lecapustulata</i>                                                    | Aptroot & Cáceres 2016                                   | Brazil, Aptroot & Cáceres 21383, ISE holotype                                    | KU257735 | –        | –        |
| <i>'Caloplaca santessoniana'</i> ad int. (sub. <i>Caloplaca</i> sp. EG-2015a in GB) | Gaya & al. 2015                                          | Chile, Gaya 19.2.11- 37 & Vargas, DUKE                                           | KT291463 | KT291558 | KT291508 |
| <i>Catenarina desolata</i>                                                          | Søchting & al. 2014a                                     | Chile, Søchting 10436a, C                                                        | KF657317 | –        | KF657319 |
| <i>Catenarina vivasiana</i>                                                         | Søchting & al. 2014a                                     | Chile, Søchting 10410, C                                                         | KF657312 | –        | KF657318 |
| <i>Eilifdahlia dahlui</i>                                                           | Kondratyuk & al. 2014a                                   | Australia, Kärnefelt 20043101, LD                                                | KJ021318 | KJ021253 | KJ021279 |
| <i>Eilifdahlia wirthii</i>                                                          | Kondratyuk & al. 2014a                                   | Namibia, Wirth & al. s.n., KW holotype                                           | KJ021319 | KJ021254 | KJ021280 |
| <i>Franwilsia bastowii</i>                                                          | Kondratyuk & al. 2014a                                   | Australia, Kärnefelt 994301, LD                                                  | KJ021324 | KJ021257 | KJ021284 |
| <i>Franwilsia kilcundaensis</i>                                                     | Kondratyuk & al. 2014a                                   | Australia, Kondratyuk 20423, LD                                                  | KJ021326 | KJ021259 | KJ021286 |
| <i>Gyalolechia aurea</i>                                                            | Arup & al. 2013                                          | Austria, Arup L97493, LD (ITS, mtSSU); Austria, Poelt & Grube s.n., GZU (nucLSU) | KC179434 | KC179196 | KC179530 |
| <i>Gyalolechia flavorubescens</i>                                                   | Arup & al. 2013                                          | Estonia, Søchting 10127, C                                                       | KC179439 | KC179197 | KC179531 |
| <i>Gyalolechia gomerana</i>                                                         | Arup & al. 2013                                          | Spain, Søchting 9653, C                                                          | KC179441 | KC179200 | KC179534 |
| <i>Huneckia crocina</i>                                                             | Wilk & al. 2021                                          | Bolivia, Wilk 2507, KRAM                                                         | MT754239 | MT835245 | MT754207 |
| <i>Huneckia pollinii</i> 1                                                          | Kondratyuk & al. 2014a (incorrect GenBank numbers cited) | USA, Missouri, Wetmore 84103, LD1061948                                          | KJ021337 | KJ021266 | KJ021297 |
| <i>Huneckia pollinii</i> 2                                                          | Kondratyuk & al. 2014a (incorrect GenBank numbers cited) | USA, Kansas, Morse 14464, LD 1276205                                             | KJ021338 | KJ021267 | KJ021298 |
| <i>Huneckia rheinigera</i>                                                          | Kondratyuk & al. 2014a                                   | Australia, Queensland, Elix 28833, LD isotype                                    | KJ021222 | –        | –        |

| SPECIES                          | REFERENCE             | VOUCHER                                                                                | ITS      | nucLSU    | mtSSU     |
|----------------------------------|-----------------------|----------------------------------------------------------------------------------------|----------|-----------|-----------|
| <i>+Leproplaca chrysodeta</i>    | Arup & al. 2013       | Sweden, Arup L7107, LD                                                                 | KC179448 | KC179206  | –         |
| <i>Leproplaca oblitterans</i>    | Arup & al. 2013       | Sweden, Arup L02331, LD (ITS, mtSSU); Norway, Arup L03472, LD (nucLSU)                 | KC179449 | KC179207  | KC179541  |
| <i>Pyrenodesmia chalybaea</i>    | Arup & al. 2013       | Austria, Sochting 9351, C (ITS, mtSSU); Sweden, Gotland, Gaya s.n. & al., BCN (nucLSU) | KC179454 | JQ301550  | KC179571  |
| <i>Pyrenodesmia variabilis</i>   | Arup & al. 2013       | Austria, Arup s.n., LD (ITS); Sweden, Arup L03134, LD (nucLSU, mtSSU)                  | AF353963 | KC179234  | KC179572  |
| <i>Rufoplaca scotoplaca</i>      | Arup & al. 2013       | Sweden, Arup L10032, LD                                                                | KC179457 | KC179235  | KC179573  |
| <i>Rufoplaca tristienscula</i>   | Arup & al. 2013       | Norway, Arup L08171, LD                                                                | KC179460 | KC179237  | KC179575  |
| <i>Seiophora lacunosa</i>        | Arup & al. 2013       | Kazakhstan, Moberg & Nordin K18:04, LD                                                 | KC179465 | KC179243  | KC179582  |
| <i>Seiophora scorigena</i>       | Arup & al. 2013       | Spain, Lanzarote & Snogerup 17201, LD                                                  | KC179466 | KC179244  | KC179583  |
| <i>Squamulea subsoluta</i>       | Arup & al. 2013       | Austria, Arup L97072, LD                                                               | AF353954 | KC179253  | KC179592  |
| <i>Usnochroma carphineum</i>     | Arup & al. 2013       | France, Roux s.n., C                                                                   | KC179468 | KC179259  | KC179598  |
| <i>Variospora aurantia</i>       | Arup & al. 2013       | Spain, Llimona s.n., C (ITS, mtSSU); Italy, Lange s.n., C (nucLSU)                     | KC179470 | KC179261  | KC179600  |
| <i>Variospora dolomiticola</i>   | Arup & al. 2013       | Spain, Thell SP0514, LD                                                                | KC179471 | KC179262  | KC179601  |
| <i>Variospora velana</i>         | Arup & al. 2013       | Italy, Arup L07194, LD (ITS); Italy, Arup L07123, LD (nucLSU, mtSSU)                   | KC179476 | KC179265  | KC179605  |
| <i>Wetmoreana brouardii</i>      | Gaya & al. 2015       | Mexico, Baja California, Gaya 03.03.10-3 & Lutzoni, DUKE                               | KT291448 | KT291536  | –         |
| <i>Wetmoreana decipiooides 1</i> | Arup & al. 2013       | South Korea, Thor 20768, UPS holotype                                                  | KC179333 | KC179269  | KC179608  |
| <i>Wetmoreana decipiooides 2</i> | Kondratyuk & al. 2013 | South Korea, Joshi & al. 100317, KoLRI                                                 | KF264643 | –         | KF264694  |
| <i>Wetmoreana decipiooides 3</i> | Kondratyuk & al. 2013 | South Korea, Joshi & al. 100327, KoLRI                                                 | KF264644 | –         | KF264695  |
| <i>Wetmoreana decipiooides 4</i> | Gaya & al. 2015       | South Korea, Thor 20768, UPS holotype                                                  | KT291453 | KT291540  | KT291487  |
| <i>Wetmoreana</i> sp. 1          | Arup & al. 2013       | Chile, Frödén 1645, LD                                                                 | KC179334 | KC179270  | KC179609  |
| <i>Wetmoreana</i> sp. 2          | Arup & al. 2013       | Peru, Frödén 1519, LD                                                                  | KC179335 | KC179271  | KC179610  |
| <i>Wetmoreana</i> sp. 3          | Arup & al. 2013       | Peru, Frödén 1521, LD                                                                  | KC179336 | KC179272  | KC179611  |
| <i>Wetmoreana texana 1</i>       | Arup & al. 2013       | Mexico, Sochting 9925, C                                                               | KC179337 | KC179273  | KC179612  |
| <i>Wetmoreana texana 2</i>       | Gaya & al. 2008       | Mexico, Wetmore 79365, BCN                                                             | EU639656 | –         | –         |
| <i>Xanthoria parietina</i>       | Arup & al. 2013       | Denmark, Sochting s.n., C                                                              | KC179411 | KC179289* | KC179629* |

\* sequences available in GenBank but not used in this study

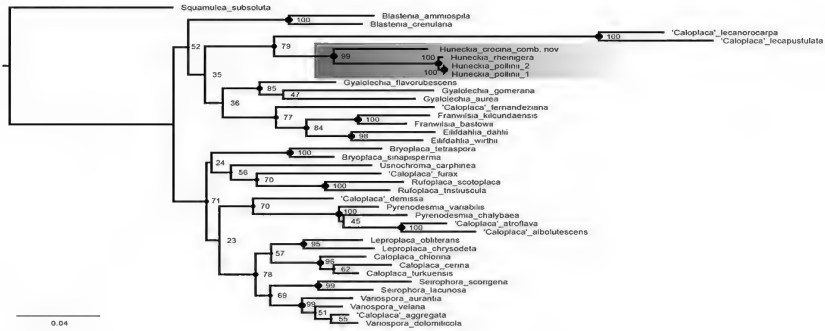


FIG. 1. Phylogenetic placement of *Huneckia crocina* within the subfamily *Caloplacoideae* derived from maximum likelihood (ML) analyses of rDNA ITS, nuLSU, and mtSSU loci. ML bootstrap values are presented at the nodes. *Squamulea subsoluta* was used to root the tree. *Huneckia* genus, including *H. crocina*, is marked with grey.

### Phylogenetic results

The phylogenetic analyses based on three rDNA loci (ITS, nuLSU and mtSSU) nest *Caloplaca crocina* within *Caloplacoideae* with a strongly supported (BS = 99) sister relationship to *Huneckia pollinii* and *H. rheinigeri* (FIG. 1; see also Wilk & al. 2021: FIG. 1, Suppl. FIG. 1). Within the *C. crocina* clade is clearly separated from the latter two species by its long branch. The *Huneckia* clade is sister to *'Caloplaca' lecapustulata* Aptroot & M. Cáceres and *'C. lecanorocarpa* Aptroot & M. Cáceres, but with only moderate support (BS = 79). The relationship of *Huneckia* to other representatives of *Caloplacoideae* is resolved without support, indicating its close relationship to *Blastenia* A. Massal., *Eilifdahlia* S.Y. Kondr. & al., *Franwilsia* S.Y. Kondr. & al., *Gyalolechia* A. Massal., and *'Caloplaca' fernandeziana* (Zahlbr.) Follmann & Redón. Before our research, the phylogenetic position of *C. crocina* was unknown, although its potential placement in *Huneckia* could be inferred based on certain morphological characters, especially the thick walls of the ascospores. Thick-walled ascospores, however, cannot be treated as distinctive for the genus, because this type of ascospore occurs also in *Flavoplaca* Arup & al. [e.g., *F. dichroa* (Arup) Arup & al. and *F. calcitrapa* (Nav.-Ros. & al.) Arup & al.; *Xanthorioideae*].

The phylogenetic analyses based on three-loci dataset (ITS, nuLSU, and mtSSU) nests *Caloplaca rouxii* within *Calogaya* (*Xanthorioideae*) (Wilk & al. 2021: FIG. 1, Suppl. FIG. 1). Within the *Calogaya* clade *C. rouxii*, *C. arnoldiiconfusa* Gaya & Nav.-Ros., and *C. saxicola* (Hoffm.) Nordin form a

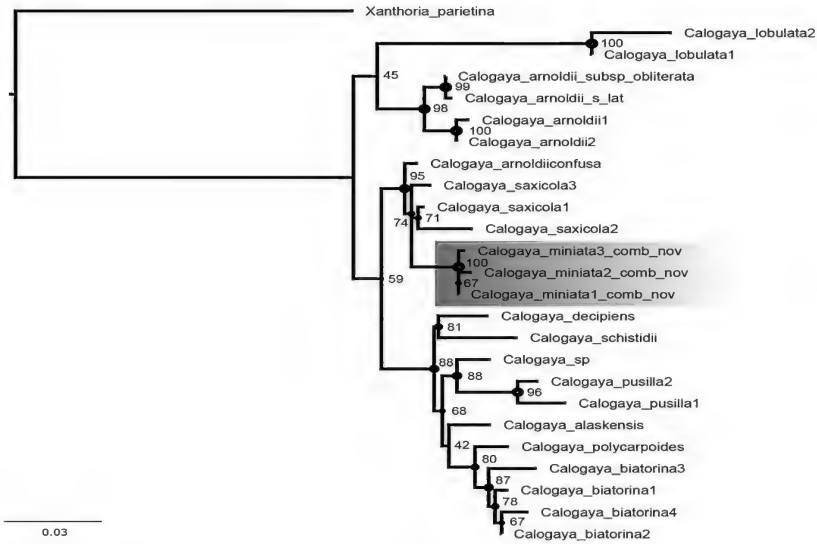


FIG. 2. Phylogenetic placement of *Calogaya miniata* (marked in grey) within the subfamily Xanthorioideae derived from maximum likelihood (ML) analyses of rDNA ITS locus. ML bootstrap values are presented at the nodes. *Xanthoria parietina* was used to root the tree.

well-supported (BS = 95) group of closely related taxa (FIG. 2). The phylogenetic position of *Caloplaca rouxii* within *Calogaya* was also studied in detail by Gaya & al. (2011), who noted the monophyly of *C. rouxii*, while *C. saxicola* appears monophyletic or polyphyletic depending on the phylogenetic analysis. The polyphyly of *C. saxicola* has been discussed in detail by Gaya & al. (2011) and Vondrák & al. (2018).

### Taxonomy: new combinations

#### *Calogaya miniata* (Hoffm.) Wilk & Lücking, **comb. nov.**

MB 839870

≡ *Psora miniata* Hoffm., Enum. Lich.: 63 (1784); Descr. Pl. Cl. Crypt. 3(2): 16 (1801).

TYPE: Spain. Catalunya, Lleida, Alt Urgell, Fígols I Alinyà, entre el Perdó dels Quatre Batlles I el Prat Llarg, elev. 2200–2382 m, 2001, Navarro-Rosinés (BCN, neotype, designated by Gaya 2009).

≡ *Lichen miniatus* Hoffm., Enum. Lich.: 62 (1784) [nom. illeg., ICN (Shenzhen) Art. 53, non *Lichen miniatus* L 1753].

≡ *Lobaria miniata* (Hoffm.) Hoffm., Deutschl. Fl. 2: 158 (1796) [“1795”].

≡ *Caloplaca rouxii* Gaya, Nav.-Ros. & Llimona, Biblioth. Lichenol. 101: 82 (2009) [nom. illeg., ICN (Shenzhen) Art. 52].

For taxonomic description, distribution, illustrations, and further synonyms, see Gaya (2009).

NOMENCLATURAL NOTES—*Calogaya miniata* was first described by Hoffmann (1784: 62), under the name *Lichen miniatus* Hoffm., an illegitimate later homonym of *L. miniatus* L. Gaya (2009) proposed *Caloplaca rouxii* as a replacement name for the illegitimate *L. miniatus* Hoffm. However, Hoffmann (1784: 62–63) had originally published two alternative names (*L. miniatus* and *Psora miniata*) for this species, both of which are valid [ICN (Shenzhen) Art. 36.3], but as *Lichen miniatus* Hoffm. is illegitimate, *Psora miniata* remains the legitimate basionym of the species, a name also used in a subsequent treatment of the species by the same author (Hoffmann 1801). Gaya's (2009) replacement name *Caloplaca rouxii* is superfluous and illegitimate, because Gaya (2009) cited *Lichen miniatus* Hoffm. as the replaced synonym and *Psora miniata* is an alternative name based on the same type [ICN (Shenzhen) Arts 52.1, 52.2(e)].

Hoffmann (1796: 158) also published the combination *Lobaria miniata*, based on *Lichen miniatus* Hoffm. Subsequently, this has been interpreted as being based on *Lichen miniatus* L., being cited as *Lobaria miniata* (L.) Hoffm. and interpreted as a homotypic synonym of *Dermatocarpon miniatum* (L.) W. Mann. However, Hoffmann's combination is clearly based on *Lichen miniatus* Hoffm., not *L. miniatus* L., both explicitly ["Enum. Lich. 62. (*Lich. miniatus*)"] and implicitly by describing the lichen as "foliois ... miniatis," i.e., scarlet or cinnabar-red, and not grey as in *D. miniatum*. The correct citation of this combination is therefore *Lobaria miniata* (Hoffm.) Hoffm. If Hoffmann had not already established the alternative name *Psora miniata* twelve years prior in 1784, *Lobaria miniata* (as a replacement name for *L. miniatus* Hoffm.) would have had priority over the erroneously presumed first publication of *Psora miniata* five years later in 1801.

Hoffmann (1784) did not cite any material in the protologue of *Lichen miniatus*/*Psora miniata*. Later he provided a color plate under the name *Psora miniata* (Hoffmann 1801: Tab. LX). However, as it cannot be established that this illustration and its underlying specimen were part of the original material, they are not available for lectotypification and have no priority in terms of typification. The neotypification proposed by Gaya (2009) is therefore appropriate.



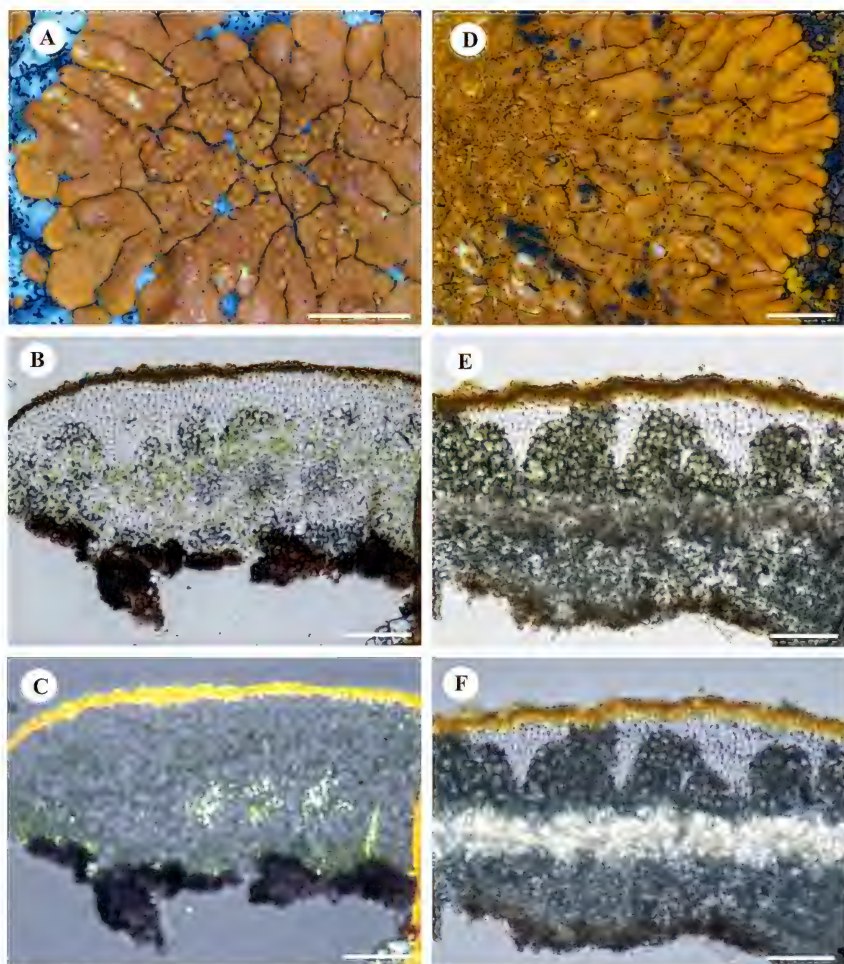


FIG. 3. *Wetmoreana brouardii*, habitus and cross section of thallus: A. Wetmore 69973 (MIN); B, C. Wetmore 79665 (MIN). *Caloplaca ochraceofulva*, habitus and cross section of thallus: D. Geesteranus 10299 (LD); E, F. Kofler (LD1066528). B, E = in regular light; C, F = in polarized light. Scale bars: A = 2.5 mm; B, C, E, F = 50 µm; D = 2 mm.

*Huneckia crocina* (Kremp.) Wilk, comb. nov.

MB 836903

≡ *Lecidea crocina* Kremp., Flora 61: 519 (1878).

TYPE: Argentina. 1873–1874, Lorentz & Hieronymus (Ml, holotype).

≡ *Caloplaca crocina* (Kremp.) Wilk & R. Vargas, Mycotaxon 132: 127 (2017).

Additional synonyms, taxonomic description, distribution, and illustrations are available in Wilk & Flakus (2017).

**TAXONOMIC NOTES**—*Huneckia* includes three species: *H. pollinii* (type species), *H. rheinigera* (Kondratyuk & al. 2014a), and the newly transferred *H. crocina*. These species are morphologically similar to one another. They produce continuous to areolate grayish thalli and dark orange to brownish, biatorine or zeorine apothecia. The apothecial margin (true exciple) is prosoplectenchymatous, composed of radiating, conglutinating hyphae. The ascospores are polarilocular, characterized by clearly thickened terminal spore walls (also called hourglass-shaped, sand-clock, or sand-glass types). The diagnostic characters for these and similar *Caloplaca* s.lat. species are discussed in Wilk & Flakus (2017: Table 1). *Huneckia* is characterized by specific anthraquinones, mainly chrysophanol, chrysophanal and rhein (Kondratyuk & al. 2014a), although the chemical composition of lichen secondary metabolites present in *H. crocina* has not been studied. The genus is mostly similar to *Blastenia*. For characters distinguishing among these taxa see Vondrák & al. (2019). *Huneckia pollinii* is widespread in the Northern Hemisphere (Wetmore 1994; Miao & al. 2018), *H. rheinigera* is known from Australia (Kondratyuk & al. 2007), and *H. crocina* is common in South America (Wilk & Flakus 2017). *Huneckia pollinii* and *H. rheinigera* are well-illustrated in Schumm & Aptroot (2019a,b) and *H. crocina* in Wilk & Flakus (2017).

### Taxonomy: new records

*Wetmoreana brouardii* (B. de Lesd.) Wilk & Søchting,

Pl. Fung. Syst. 65(2): 562. 2020.

FIG. A–C

A taxonomic description is available in Wetmore & Kärnefelt (1998).

**SPECIMENS EXAMINED**—CHILE. VALPARAÍSO, Cuesta de Chacabuco, Follmann 12885 (B). COLOMBIA. CUNDINAMARCA, Nariño, Munic. Imues, near El Pedregal, towards Túquerres, on road Pasto-Tumaco, elev. 1880 m, 16 June 1986, Sipman 33540 (B). PERU. DEPT. AREQUIPA, Prov. Caylloma, Cañon del Colca canyon, below Tapay village, open semi-desert montane area, elev. 2774 m, 6 July 2006, Flakus 9663 & Cykowska (KRAM; fertile specimen). URUGUAY. DEPT. CANELONES, Parador Tajés, El Cerroto, elev. 10–20 m, 19 Feb 1950, Osorio 2135 (B). MEXICO. BAJA CALIFORNIA SUR, Sierra Laguna, along river bottom Picacho de La Laguna, elev. 500 m, 16 Feb 1993, Wetmore 72011 (B), open oak forest (*Quercus tuberculata*) with shrubs, along ridge leading to the crest after turnoff to Rancho La Victoria, elev. 1400 m, 6 Jan 1998, Wetmore 79665 (MIN). CHIHUAHUA, Sierra la Cinguita, eastern side, 9 km west of Moctezuma along route 10, elev. 1120 m, 16 March 1992, Wetmore 69973 (MIN).

**MATERIAL INVESTIGATED FOR COMPARISON**—*Caloplaca ochraceofulva*. (FIG. 3, D–F) KENYA. RIFT VALLEY PROVINCE, distr. Nakuru, 1949, Geesteranus 10299 & L4644a

TABLE 2. Comparison of *Wetmoreana brouardii* and *Caloplaca ochraceofulva*

| CHARACTERS                       | <i>W. brouardii</i>                                                                                  | <i>C. ochraceofulva</i>                                                                                                                                                                |
|----------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VEGETATIVE PROPAGULES            | Papillae, laminal                                                                                    | Isidia, marginal                                                                                                                                                                       |
| SPORES ( $\mu\text{m}$ )         | 10–13 $\times$ 4–6                                                                                   | 10–16 $\times$ 4–8                                                                                                                                                                     |
| SEPTUM ( $\mu\text{m}$ )         | 2.5–3.5                                                                                              | 2–4                                                                                                                                                                                    |
| THALLUS                          | Thin                                                                                                 | Thick                                                                                                                                                                                  |
| LOBE THICKNESS ( $\mu\text{m}$ ) | 90–250                                                                                               | 130–400                                                                                                                                                                                |
| CORTEX                           | Cell lumina rounded                                                                                  | Cell lumina elongated                                                                                                                                                                  |
| CORTEX CONES                     | Absent or indistinct                                                                                 | Distinct                                                                                                                                                                               |
| ALGAE                            | Continuous                                                                                           | Discontinuous, in distinct groups                                                                                                                                                      |
| MEDULLA                          | Thin, indistinctly separated from the algae layer                                                    | Thick, distinctly separated                                                                                                                                                            |
| CAOX CRYSTALS                    | Absent (medulla may illuminated in polarized light due to the lichen substances, in K & N insoluble) | Distinct layer (35–75 $\mu\text{m}$ thick; in K insoluble, in N soluble) at a distance of c. 100 $\mu\text{m}$ from the thallus surface, on the border between algal layer and medulla |
| PYCNIDIA                         | Rare                                                                                                 | Common                                                                                                                                                                                 |
| CONIDIA ( $\mu\text{m}$ )        | Long bacilliform, 4.0 $\times$ 1.1 (mean)                                                            | Short bacilliform or ovoid, 3.1 $\times$ 1.2 (mean)                                                                                                                                    |
| SUBSTRATE                        | Siliceous rocks                                                                                      | Siliceous or calcareous rocks                                                                                                                                                          |
| DISTRIBUTION                     | Widespread in Americas, and Arabian Peninsula                                                        | Widespread in Africa, and Arabian Peninsula and South America                                                                                                                          |
| REFERENCES                       | This paper                                                                                           | This paper                                                                                                                                                                             |

(LD). **LESOTHO.** **LERIBE**, Buthabuthe, 1963, Kofler s.n. (LD1066528, LD1066592), Kopje near Buthabuthe, 1963, Kofler s.n. (LD1024127). **NAMIBIA, OTJOZONDJUPA REGION**, Waterberg Plateau National Park, primary forest with large *Ficus* at the base of Waterberg Plateau, elev. 1469 m, 15 June 2019, Flakus 19/162 (KRAM, DUKE). **SOMALILAND.** **Serrubgebirge**, 1885, Hildebrandt s.n. (G66459, Lectotypus). **SOUTH AFRICA.** **NATAL**, Vryheid Div., 1953, Almborn 7976 (LD1024960, LD1024896; fertile specimens). **ORANGE FREE STATE**, Div. Ladybrand, 1949, Geesteranus L6546 (LD). **SAUDI ARABIA.** **ASIR REGION, Al Dalaghan area**, Asir National Park, 1982, Zapletal s.n. (BM1247493, E905776, E905777). **ARGENTINA, JUJUY**, Santa Barbara, 1901, Fries 50 (LD). **URUGUAY, DEPT. MALDONADO**, Rio de la Plata, Isla Gorriti, 1984, Osorio 8345 (MIN).

**TAXONOMIC NOTE**—*Wetmoreana brouardii* is characterized by the clearly lobate, thin thallus, closely appressed to the substratum. The thallus is orange to reddish, abundantly covered by distinct, laminal papillae. According to Wetmore & Kärnefelt (1998) apothecia are very rare, sessile, and  $\leq 0.5$  mm; the ascospores are polarilocular (11–14  $\times$  5.5–7.0  $\mu\text{m}$ ) with a 3.5–4.0  $\mu\text{m}$  thick septum.

*Wetmoreana brouardii* is often misidentified as *Caloplaca ochraceofulva*, which is closely related (Wilk & Lücking, unpubl. data) but which differs from

*W. brouardii* in having a distinctly thicker, yellow-orange (not reddish) and isidiate thallus. Another distinguishing feature is the presence or absence of calcium oxalate crystals (pol+ white) in the thallus. They are present in *C. ochraceofulva*, forming a distinct layer along the border between the algal layer and medulla, but absent in all studied material of *W. brouardii* (FIG. 3, TABLE 2). Medullary crystals are diagnostic for other *Wetmoreana* species, such as *W. appressa*, *W. texana*, and the probably related *Caloplaca eugyra* (Tuck.) Zahlbr. (Wetmore & Kärnefelt 1998).

**HABITAT AND DISTRIBUTION**—*Wetmoreana brouardii* occurs on siliceous rocks. It was reported from North America in Mexico and USA (Nash & al. 1998; Wetmore & Kärnefelt 1998); from the Arabian Peninsula in Saudi Arabia (Bokhary & al. 1993) and Qatar (Al-Thani & Al-Meri 2011); from Central America in Guatemala (Wetmore & Kärnefelt 1998), and from South America in Brazil (Aptroot & al. 2017), Ecuador (Galapagos Islands), (Bungartz & al. 2013), and Venezuela (Aptroot 2015).

New records of *Wetmoreana brouardii* are reported here from Chile, Peru, Uruguay, and Colombia. The Peruvian material cited previously by Wetmore & Kärnefelt (1998) lacked locality data, provided here.

#### Acknowledgements

I am grateful to R. Lücking (BGBM, Germany), M. Kukwa (UG, Poland), A. Beck (BSM, Germany), and Shaun Pennycook for reviewing the manuscript and providing important suggestions and improvements. I thank the curators of the herbaria B, BM, E, G, KRAM, LD, M, MEL, MIN, S and UPS for loan of specimens. Financial support was provided by the National Science Centre (NCN, grant no. N N303 821740).

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